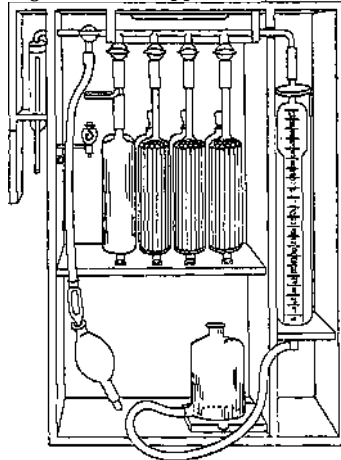


Fig. i. — Orsat Apparatus.



is designed to oxidize small quantities of hydrogen should their determination be called for. At the extreme end, where the gases enter the apparatus, there is arranged a filter tube with pad of cotton-wool to remove particles of smoke and soot from the sample before

measurement. For a simple determination of carbon dioxide and oxygen, No. 1 pipette is charged with a solution of caustic potash, made by dissolving 1 part solid caustic potash in 2 of water; this serves to absorb the carbon dioxide. No. 2 pipette is filled with an alkaline solution of pyrogallous acid made by dissolving 20 gm. of pyrogallous acid in 100 c. c. of water and adding 350 c. c. of a strong solution of caustic potash (1 to 2). The measuring tube is filled with water, or with a solution of glycerine, by opening the outlet tap at the far end and raising the bottle. The tap is then turned to connect with the filter tube, and some of the sample is drawn in by lowering the pressure bottle. This is then ejected once or twice to sweep out air from the connections, and finally a quantity is drawn in and measured after adjustment of the water level. About 100 c. c. is used for the analysis. The gases are transferred in turn to the potash pipette, where contact is maintained till no further reduction in volume takes place, and to the pyrogallate, careful measurements of the volume absorbed being made in each case. The readings are taken after adjustment of the level as at the start, and the shrinkages in the two pipettes, reckoned per 100 c. c. of sample, give the percentages by volume of carbon dioxide and oxygen respectively.

If it is desired to ascertain the amount of carbon monoxide present in flue gases, the Orsat apparatus may be used for this determination also. The third absorption pipette shown in the figure is filled with an ammoniacal solution of cuprous chloride, and the gas remaining after complete treatment

with the liquids of the first and second is brought in turn into contact with this, till no further shrinkage in volume is observed on returning to the measuring cylinder. The final difference in volume reckoned per 100 c. c. gives the percentage of carbon monoxide. Except in cases where a considerable shortage of air for combustion has prevailed in the furnace, the remainder of the sample of gas will consist of nitrogen, the volume of which will be got by deducting the percentages of the constituents as determined, from 100. Where combustion has been incomplete, however, the possibility of hydrogen and hydrogen-containing gases being present must be taken into account.

The accurate analysis of gaseous fuels and other complex mixtures of gases is an operation demanding not only specialized apparatus but a con-